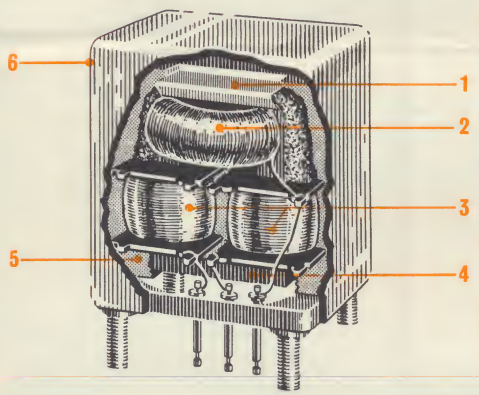
VARI-L®

CONDENSED CATALOGUE

ELECTRICALLY-VARIABLE INDUCTORS
SWEEP OSCILLATORS
DEVELOBOARDS

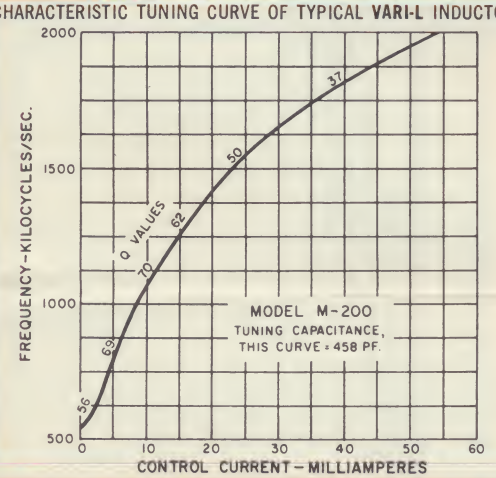
Our new General Catalog of **Vari-L** products is in preparation, and we hope to include a number of new developments. Work is nearly completed on new VHF variable-inductor designs and new resonant-cavity designs which will extend the useful region of our devices up into the gigaherz range. There are also new higher-inductance lower-frequency "Mite"-Series units, and a precision error-correcting tuning module utilizing feedback techniques. Meanwhile, the directory-type advertisement on the inside pages gives an overall view of our products, and a comprehensive catalog will be sent you later. Please make sure we have your correct address on our mailing list.

CUT-AWAY OF **VARI-L** INDUCTOR



1) Permanent magnet 3) Control coils 5) Epoxy encapsulant
2) Toroidal signal winding 4) Control yoke 6) Steel shield can

CHARACTERISTIC TUNING CURVE OF TYPICAL **VARI-L** INDUCTOR



OPERATING PRINCIPLES

Illustrated in cutaway form at left, our highly-specialized design of a saturable-core reactor controls the inductance of one coil as a function of the current flowing in another. This action can take place very slowly or at high rates of speed — up to several million changes per second and completely without moving parts. The command can come from a manually-operated source, an electronic circuit, or a transducer. Thus, the VARI-L inductor is a most useful device for remote-control or closed-loop systems, for sweeping either oscillators or passive filters, and for frequency switching. Typical equipments in which it has become a standard component are receivers (both as a local oscillator and a gang-tuned RF amplifier), sweep generators of all types from AF to VHF, transmitters (as a frequency modulator), ultrasonic testing instruments, and spectrum analyzers. Illustrative circuits are shown on the back of this folder. The military applications are too numerous and diversified to describe, but the environments range all the way from the ocean floor to outer space. Since the unit is ruggedized and completely solid-state, field failures are virtually unknown, some VARI-L-equipped instruments still going strong after at least twelve years of service.

The toroidal coil (signal winding) visible in the illustration is wound on a core of powdered iron, ferrite, or metal alloy, and is mounted, usually with an air-gap, on a separate, U-shaped core of ferrite or laminated metal. The latter has at least one, and sometimes several control windings, completely isolated from the signal winding. These two elements are all that are absolutely necessary, but they tend to produce a characteristic curve with considerable bending at the start; so in most of the models a small, carefully-stabilized permanent magnet is mounted above the toroid to give it bias and straighten the curve. The whole assembly is cushioned with silicone rubber and encapsulated in epoxy. A steel can is often slipped over this to provide shielding.

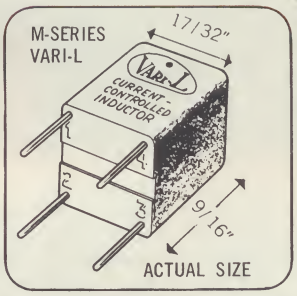
Familiarity with the VARI-L is helpful when designing it into a final circuit, but to the engineer working with it for the first time we advise that you connect the signal winding into the tuned circuit just as you would any high-Q coil, resonate it with a suitable tuning capacitor, and connect a source of continuously-variable current (such as a battery and rheostat) to the control winding. You will be surprised at the ease and smoothness which the frequency can be controlled by varying the current. A tracked chain of several such units can be controlled equally well, all tuned to the same frequency or to harmonically related ones. Shown in Figure 2 is the characteristic curve of a typical VARI-L inductor.

INFORMATION AVAILABILITY/SALES POLICY

We service inquiries promptly with literature which is as complete and as informative as we can make it. Condensed listings such as those on the inside pages of this folder are displayed annually in Electronic Engineers' Master, and Electronics Buyers' Guide. Complete coverage of current catalogues is carried in VSMF, the Microfilm File. We pursue a liberal sampling policy insofar as is economically feasible, and we provide consultation service by telephone. Many of our sales contacts are made in this way, and customers tell us that they deeply appreciate being able to converse with someone well-informed on our products and their applications. We sell through manufacturer's representatives in some territories, and we back them up as necessary by visits of factory personnel. Sales are made directly from our plant to yours, and orders for stock models are usually shipped the day after they are received in the mail. Telegraphic and phone orders received by noon are shipped the same day in most instances. Small orders can be shipped economically by air or first-class mail, so it is not uncommon for an engineer to have the component in his hands the day after he has requisitioned it. We are a small enough firm to give fast personalized service but large in facilities and know-how. Twelve years experience in frequency control are at your disposal. Write or call soon.

VARI-L® SOLID-STATE CURRENT-CONTROLLED TUNING

Vari-L Inductors control frequency, instantly and predictably, in response to changes in a small control current. They have no moving parts to wear, stick or creep, and have been in use for over a dozen years in scores of no-nonsense applications from hydrospace to aerospace.

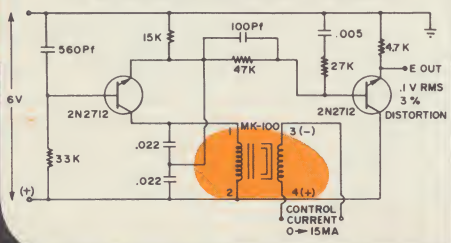


The new **"MITE"** series are half-inch cubes, sized for circuit boards—about 1/10 the volume of the original units and drawing 1/2 to 1/4 the power. Twenty graduated models, as shown in the graph, provide coverage from 2 KC to 300 MC (100 MH to .05 μH) — some with frequency ranges as great as 15:1. Production experience has resulted in a semi-automated epoxy-encapsulating technique and a dramatic reduction of costs to 1/2 to 1/3 that of the original **Vari-Ls.** In most respects the **"MITES"** equal or exceed the performance of the older models, and new types just being developed will offer capabilities not heretofore available anywhere.

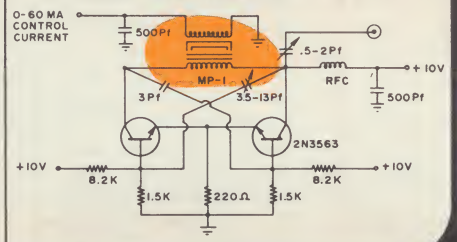
The **"MITE"** line is being expanded, and is expected gradually to replace the original "Standard" line (table on next page) on our shelves. However, these old standbys will always be available for higher-power applications and as a basis for the many special designs we produce.

We welcome your specific inquiries, and are co-operative in sampling if you have a genuine production application.

5-75 KC OSCILLATOR .1 V RMS OUT LEVEL 3DB V



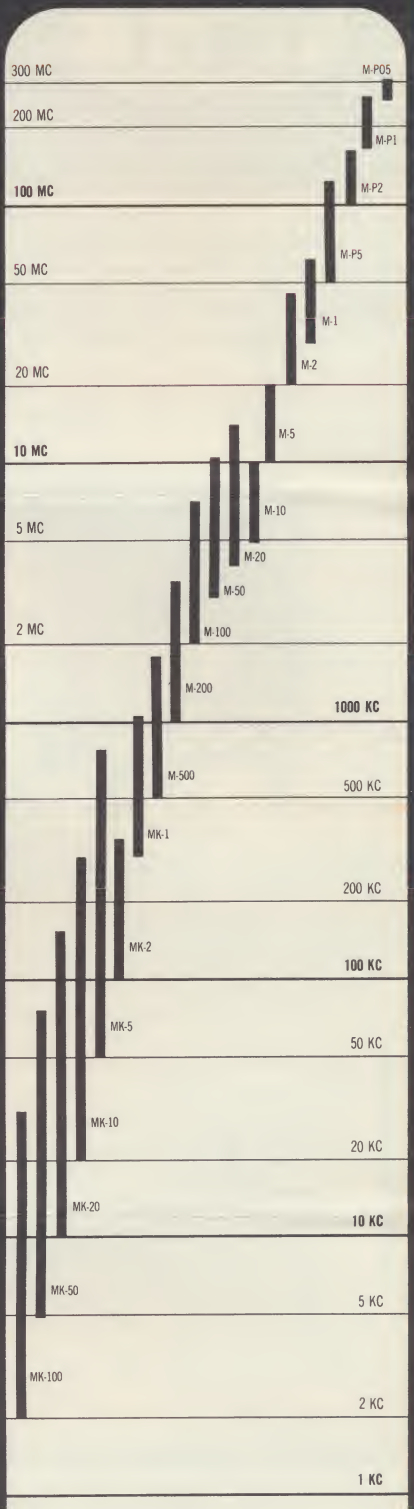
OSCILLATOR – 260 – 380 MHZ 1MW INTO 50Ω



"MITE" SERIES

MODEL	INDUCTANCE AT ZERO CONTROL CURRENT ±10% (L_s)	INDUCTANCE AT MAX. RECOMMEND. CONTR. CURRENT (L_{sat})	TYP. FREQ.† AT ZERO CONTROL CURRENT (F_s)	HIGH-FREQ. END OF RANGE WITH F_s SHOWN (F_{sat})	CONTROL WINDING INDUCTANCE ±20% (L_c)	PRICE ONE UNIT (Lower in Quantities) subject to change without notice
MK-100	100 MH	.445 MH	2 KC	30 KC	450 MH	$16.30
MK-50	50 MH	.223 MH	5 KC	75 KC	450 MH	16.30
MK-20	20 MH	.089 MH	10 KC	150 KC	450 MH	16.30
MK-10	10 MH	.045 MH	20 KC	300 KC	450 MH	16.30
MK-5	5 MH	.022 MH	50 KC	750 KC	450 MH	16.30
MK-2	2 MH	.163 MH	.1 MC	.35 MC	160 MH	16.30
MK-1	1 MH	.082 MH	.3 MC	1.05 MC	160 MH	16.30
M-500	500 μH	40.8 μH	.5 MC	1.75 MC	160 MH	15.80
M-200	200 μH	16.3 μH	1 MC	3.5 MC	160 MH	15.80
M-100	100 μH	8.15 μH	2 MC	7 MC	160 MH	15.80
M-50	50 μH	4.08 μH	3 MC	10.5 MC	160 MH	15.80
M-20	20 μH	1.63 μH	4 MC	14 MC	160 MH	15.80
M-10	10 μH	2.5 μH	5 MC	10 MC	80 MH	15.80
M-5	5 μH	1.25 μH	10 MC	20 MC	80 MH	15.80
M-2	2 μH	.5 μH	20 MC	40 MC	80 MH	15.80
M-1	1 μH	.25 μH	30 MC	60 MC	75 MH	15.80
M-P5	.5 μH	.125 μH	60 MC	120 MC	75 MH	15.80
M-P2	.2 μH	.078 μH	100 MC	160 MC	55 MH	15.80
M-P1	.1 μH	.051 μH	170 MC	240 MC	55 MH	15.80
M-P05	.05 μH	.035 μH	250 MC	300 MC	55 MH	15.80

For all MITE models, Control-Winding Resistance is 75 ohms and maximum recommended Control Current is 60 MA. Shielding cans are available at $1 extra per unit.



TYPICAL FREQUENCY RANGES OF THE 20 "MITE"-SERIES MODELS

The ranges shown are approximate and usually may be extended

VARI F® **Vari-F** units are compact all-solid-state component-style sweep oscillators covering very wide bands without band-switching: for example, 100 cps to 10 KC for Model SA-17A. They contain a **Vari-L** inductor and are tuned electrically.

VARI-L COMPANY, INC. / 207 GREENWICH AVENUE / STAMFORD / CONNECTICUT / 06904 / PHONE 203 323-2176

VARI-L® SOLID-STATE CURRENT-CONTROLLED TUNING

"STANDARD" SERIES

MODEL	INDUCTANCE AT ZERO CONTROL CURRENT ±10% (L_s)	INDUCTANCE AT MAX. RECOMMEND. CONTR. CURRENT (L_{sat})	TYP. FREQ.† AT ZERO CONTROL CURRENT (F_s)	HIGH-FREQ. END OF RANGE WITH F_s SHOWN (F_{sat})	MAX. RECOMM. CONTROL CURRENT ($I_{c\ max}$)	CONTROL WINDING INDUCTANCE ±20% (L_c)	CONTROL WINDING RESISTANCE ±10% (R_c)	DIMENSIONS (inches)	PRICE ONE UNIT (Lower in Quantities) subject to change without notice
EL-215	130 Henries	.58 Henries	200 Cycles	3000 Cycles	50 MA	2.5 Henries	20 Ohms	1½ x 1½ x 1¾H	$57.75
PA-28	4 Henries	63 MH	1000 Cycles	8000 Cycles	50 MA	7.2 Henries	450 Ohms	1½ x 1½ x 2¾H	57.75
TF-2X10	1 Henry	10 MH	5000 Cycles	50 KC	50 MA	5 Henries	450 Ohms	1½ x 1½ x 1¾₁₆H	52.25
PA-3Y6	500 MH	14 MH	7500 Cycles	45 KC	50 MA	4.3 Henries	450 Ohms	1½ x 1½ x 2¾H	43.45
PA-4U6	100 MH	3 MH	15 KC	90 KC	50 MA	4.3 Henries	450 Ohms	1½ x 1½ x 2¾H	43.45
PA-47	5 MH	.1 MH	50 KC	350 KC	40 MA	7 Henries	450 Ohms	1½ x 1½ x 2¾H	52.25
TF-59	5 MH	.06 MH	100 KC	900 KC	50 MA	5 Henries	450 Ohms	1½ x 1½ x 1¾₁₆H	49.50
PA-56	.8 MH	.02 MH	400 KC	2.4 MC	40 MA	5 Henries	450 Ohms	1½ x 1½ x 2¾H	52.25
PA-6Y3	320 μh	3.5 μh	750 KC	2.25 MC	50 MA	3 Henries	450 Ohms	1½ x 1½ x 2¾H	49.50
PA-63	45 μh	5 μh	2 MC	6 MC	50 MA	3 Henries	450 Ohms	1½ x 1½ x 2¾H	49.50
PA-6T3	16 μh	2.05 μh	4 MC	11.2 MC	50 MA	3 Henries	450 Ohms	1½ x 1½ x 2¾H	49.50
PA-7X2	4.5 μh	1.1 μh	8 MC	16 MC	40 MA	1.25 Henries	775 Ohms	1½ x 1½ x 2¾H	49.50
MF-58	320 μh	5 μh	750 KC	6 MC	25 MA	1.3 Henries	400 Ohms	1⅜ x ⅝ x 1¾H	35.75
MF-68	50 μh	.75 μh	1.5 MC	12 MC	25 MA	1.3 Henries	400 Ohms	1⅜ x ⅝ x 1¾H	35.75
MF-62	7 μh	1 μh	8 MC	20 MC	50 MA	1.6 Henries	400 Ohms	1⅜ x ⅝ x 1¾H	35.75
MF-7R2	1.6 μh	.4 μh	20 MC	40 MC	50 MA	1.3 Henries	400 Ohms	1⅜ x ⅝ x 1¾H	35.75
MF-7W2	.5 μh	.15 μh	60 MC	108 MC	50 MA	1.3 Henries	400 Ohms	1⅜ x ⅝ x 1¾H	35.75
MF-82	.2 μh	.09 μh	100 MC	150 MC	50 MA	1.3 Henries	400 Ohms	1⅜ x ⅝ x 1¾H	35.75
MF-811C	.1 μh	.065 μh	165 MC	206 MC	50 MA	1.3 Henries	400 Ohms	1⅜ x ⅝ x 1¾H	35.75
SPECIAL-PURPOSE TYPES									
MF-52	.25 MH	.05 MH	500 KC	Low temp. drift, low hysteresis. Ideal for FM				1½ x 1½ x 2¾H	41.80
E-4Y8	40 MH	.65 MH	25 KC	Delayed response for max. usable range				1½ x 1½ x 2½H	52.25
TF-4X1	7 MH	3.1 MH	50 KC	Very low drift, low hysteresis — for telemetering				1½ x 1½ x 2½H	52.25
TF-3W2	200 MH	39 MH	5 KC	Audio/Ultrasonic Range; low hysterisis, good temp stability				1½ x 1½ x 2½H	57.75
WF-4R7	25 MH	.5 MH	50 KC	To sweep 100 KC region without dimensional resonances				1 x 1³²⁄₃₂ x 2¼H	49.50

†–Frequencies shown are a rough guide for use when the inductor will be employed in a resonant circuit. Wide latitude can be exercised to favor such considerations as **Q, L/C Ratio,** or optimum **Impedance** for a given circuit.

DEVELOBOARD® BREADBOARDING CIRCUIT MODULES

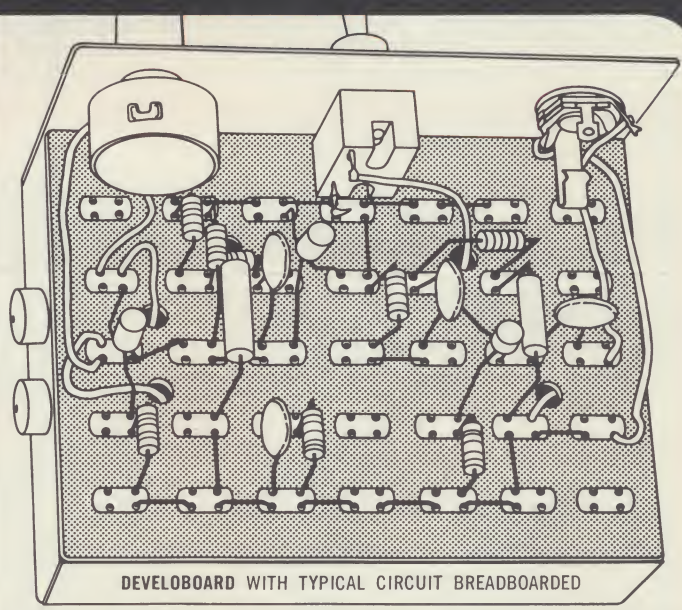
The Model 10 Develoboard is a proven tool in many laboratories and classrooms for the rapid assembly and disassembly of experimental circuits. It comes assembled ready for immediate use and incorporates 35 connectors, each of which is capable of making a firm junction between up to four wires of random diameters from .010" to .045". All mating surfaces of the contacts are carefully burnished by a patented process which makes for smooth insertion and a minimum of abrasion, so that components can be used over and over. Leads are left their original length, and after breadboarding the parts are usually perfectly OK for soldering into a prototype assembly.

The outer, spring portion of the contact is of phosphor bronze, and the insert is of brass. Both parts are heavily tin-plated for lubricating action and low contact resistance. The board itself is phenolic and is riveted to a sturdy steel frame 3¾" x 5" x 1¼" high, finished in cadmium plate and iridite. This frame is drilled for mounting of phone-tip or banana jacks and for controls. It also has holes which permit bolting two or more units together. An accessory panel comes with the unit and holds additional controls and switches.

Prices: Net prices are shown at right, f.o.b. Stamford, Conn., subject to change without notice. We will be happy to quote discounts on larger quantities or on special boards made to your design. Some distributors stock the Model 10; inquiries from others are welcome.

Terms: Rated firms, 30 days net. If you have not established credit, send cash with order, and we will ship postpaid.

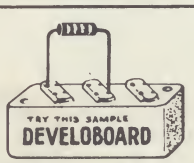
QUANTITY	PRICE EACH
1 - 4	$16.65
5 - 11	15.00
12 - 49	13.65
50 - 99	12.40
100 - 249	11.30



DEVELOBOARD WITH TYPICAL CIRCUIT BREADBOARDED

FREE SAMPLE

Write on business letterhead, giving job title, to request miniature sample shown here. See for yourself quality construction in VARI-L DEVELOBOARDS.



SEE OUR SPECIFICATIONS IN VSMF MICROFILM CATALOG FILE

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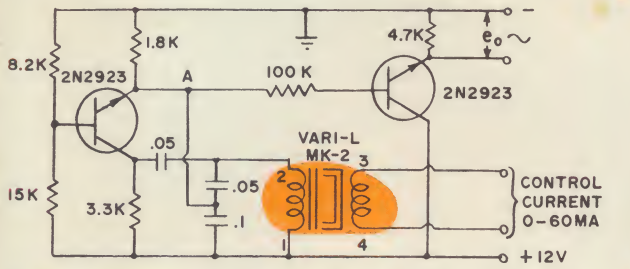
VARI-L CIRCUITS

The circuits on this page have been developed in our laboratory to explore the feasibility of using the VARI-L inductor for certain types of applications. We have made no determination whether any of these circuits, or modifications of them, involve patent infringement.

VARIABLE-FREQUENCY SINUSOIDAL OSCILLATOR WITH LOAD-ISOLATION STAGE

FREQUENCY RANGE 20–70 KC e_o = .3V RMS NOMINAL DISTORTION < 2%

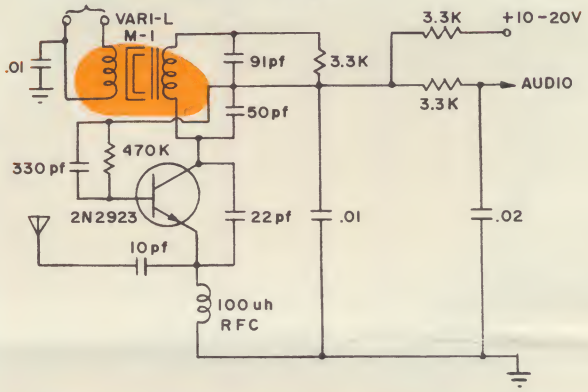


NOTE: (1) SUBSTITUTION OF A SUITABLE RFC FOR THE 3.3K RESISTOR WILL RESULT IN HIGHER OUTPUT VOLTAGE.
(2) WHEN WORKING INTO HIGH IMPEDANCES ($Z_L \geq$ 10K) THE EMITTER FOLLOWER CAN BE OMITTED AND THE OUTPUT TAKEN FROM POINT A.

REMOTE-TUNED SUPER-REGENERATIVE DETECTOR

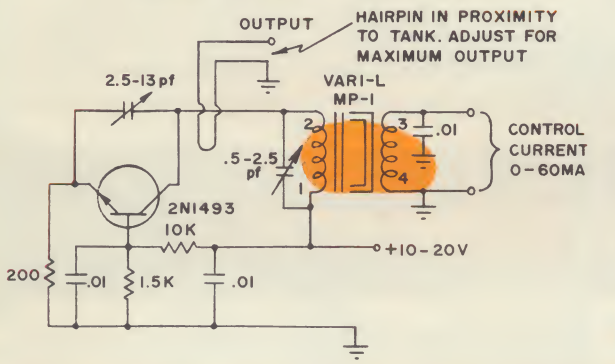
25 TO 50 MC

CONTROL CURRENT 0 — 60 MA



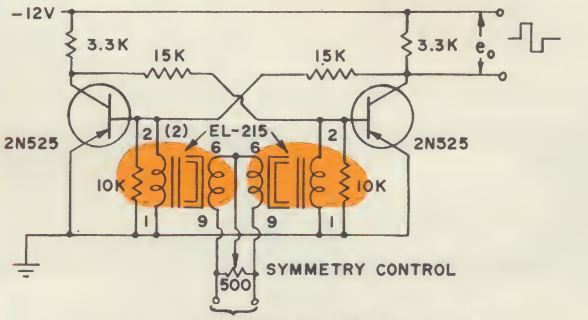
VARIABLE-FREQUENCY VHF OSCILLATOR

FREQUENCY RANGE 170–240 MC



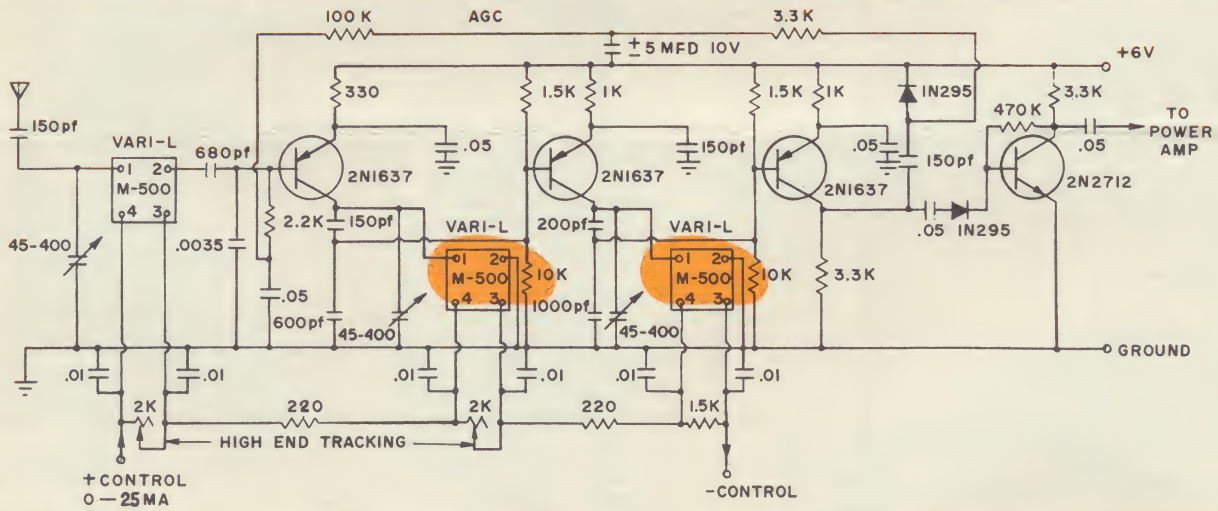
HIGH-RANGE VARIABLE-FREQUENCY & SYMMETRY ASTABLE MULTIVIBRATOR UTILIZING 2 VARI-L MODEL EL-215 INDUCTORS

FREQUENCY RANGE .5–1000 CPS



CONTROL CURRENT 0–100 MA

REMOTELY-TUNED TRF RECEIVER FOR 540–1900 KC



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10M366
Printed in USA

PRICE LIST

PRODUCTS OF VARI-L CO., INC. EFFECTIVE JUNE 1, 1965

VARI-L CURRENT CONTROLLED INDUCTORS MODELS	NET PRICE EACH FOR QUANTITY INDICATED									
	QUANTITY									
	1	2-5	6-11	12-49	50-99	100-249	100-499	250-499	500-999	1000-4999
MK-1 MK-20 MK-2 MK-50 MK-5 MK-100 MK-10	$16.30	14.80	13.50	12.40	11.40		10.60		9.95	9.45
	FOR PRICE WITH STEEL SHIELD, SEE †BELOW									
M-P05 M-10 M-P1 M-20 M-P2 M-50 M-P5 M-100 M-1 M-200 M-2 M-500 M-5	$15.80	14.40	13.10	12.00	11.05		10.25		9.65	9.15
	FOR PRICE WITH STEEL SHIELD, SEE †BELOW									
PA-63 PA-7X2 PA-6T3 TF-59 PA-6Y3 WF-4R7	$49.50	45.05	41.10	37.95	34.95	32.20		30.20		
PA-28 EL-215 PA-36 TF-3W2	$57.75	52.55	47.95	43.90	39.45	37.55		35.20		
PA-47 TF-2X10 PA-56 TF-4X1 E-4Y8	$52.25	47.55	43.40	39.70	36.60	33.95		31.90		
PA-3Y6 PA-4U6	$43.45	39.55	36.05	33.05	30.40	28.25		26.50		
MF-52	$41.80	38.05	34.70	31.80	29.25	27.20		25.50		
MF-58 MF-7R2 MF-62 MF-7W2 MF-68 MF-8IIC MF-7K2 MF-82	$35.75	32.55	29.70	27.20	25.05	23.25		21.90		
	THESE PRICES ALSO APPLY TO MODELS AT LEFT WITH "C" SUFFIX.									
OM-101* OM-103* OM-102*	$66.00	60.05	54.80	50.15	46.20	42.90		40.25		

*WITH 28 VOLT, 10 WATT HEATER AND SLOW MAKE-AND-BREAK THERMOSTAT. OTHER ARRANGEMENTS SLIGHTLY HIGHER. MODELS GROUPED BETWEEN DOUBLE LINES MAY BE ASSORTED TO EARN QUANTITY DISCOUNT.

†M SERIES UNITS CAN BE SUPPLIED WITH STEEL SHIELD (ATTENUATES RANGE APPROX. 10% AND NOT RECCOMMENDED EXCEPT FOR SEVERE HUM CONDITIONS.) TO SPECIFY, ADD "S" TO THE MODEL NUMBER AND $1 TO THE NET PRICE.

VARI-F SWEEP OSCILLATORS MODELS	QUANTITY			
	1-4	5-11	12-49	50-UP
SA-17A SA-17B	$195.00	165.00	146.00	QUOTATION UPON REQUEST.

DEVELOBOARD BREAD-BOARD MODELS	QUANTITY					
	1-4	5-11	12-49	50-99	100-249	250-UP
10	$16.65	15.00	13.65	12.40	11.30	QUOTATION UPON REQUEST.

TERMS: NET, 30 DAYS; FOB POINT: STAMFORD, CONN. ABOVE PRICES APPLICABLE IN THE UNITED STATES, ITS POSSESSIONS, AND CANADA AND ARE SUBJECT TO CHANGE WITHOUT NOTICE. FOREIGN QUOTATIONS MADE UPON REQUEST. ORDER DIRECTLY FROM OUR PLANT.